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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/938,543	08/27/2001	Evelyn Boettcher	P 0276890 os-0004	2789

909 7590 02/27/2004

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EXAMINER	
MARKHAM, WESLEY D	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/938,543	BOETTCHER ET AL.	
	Examiner	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-41* is/are pending in the application.

4a) Of the above claim(s) *24-33 and 39-41* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,8-11,14,15,18,20-23 and 34-38* is/are rejected.

7)☒ Claim(s) *5-7,12,13,16,17 and 19* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 August 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/27/01*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1 – 23 and 34 – 38, drawn to a method of producing / enhancing the photosensitivity of an optical element, classified in class 427, subclass 163.2.

   II. Claims 24 – 33 and 39 – 41, drawn to an optical element, classified in class 385, subclass 141.

2. The inventions are distinct, each from the other because of the following reasons: Inventions I and II are related as process of making and product made, respectively. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process, such as (1) a process in which the optical element is not disposed in a "confinement chamber", (2) a process in which the temperature of the hydrogen-rich atmosphere is not increased over a portion of the treatment time, (3) a process in which the temperature of the hydrogen-rich atmosphere is not varied during the treatment time, and (4) a process in which the hydrogen partial pressure is not maintained below 1 atm during the treatment time.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and

recognized divergent subject matter, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Mr. Henry Daley on 1/9/2004, a provisional election was made with traverse to prosecute the invention of Group I, Claims 1 – 23 and 34 – 38. Affirmation of this election must be made by the applicant in replying to this Office Action. Claims 24 – 33 and 39 – 41 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Information Disclosure Statement

6. The IDS filed by the applicant on 8/27/2001 is acknowledged, and the references listed thereon have been considered by the examiner as indicated on the attached copy of the PTO-1449 form.

Drawings

7. The formal drawings (1 sheet, 2 figures) filed by the applicant on 8/27/2001 have been received. The drawings are objected to as failing to comply with 37 CFR

1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: "P_1" in Figure 2. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office Action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

8. The abstract of the disclosure is objected to because the abstract appears to contain typographical errors (i.e., missing commas) that render the aforementioned abstract confusing. Specifically, it appears as though the phrase, "exposing the optical element to a hydrogen-rich atmosphere for a treatment period of time varying temperature of the hydrogen-rich atmosphere during the treatment period and irradiating the optical element with electromagnetic radiation" should read, "exposing the optical element to a hydrogen-rich atmosphere for a treatment period of time, varying temperature of the hydrogen-rich atmosphere during the treatment period, and irradiating the optical element with electromagnetic radiation" in order for the abstract to be clear. Correction is required. See MPEP § 608.01(b).

Claim Observations

9. The examiner notes that Claim 13 depends from Claim 14 (i.e., a later claim), and the preamble of Claim 13 ("A method of enhancing photosensitivity of an optical element...") matches the preambles of Claim 1 – 12, not the preamble of Claim 14

("A method of producing an optical element..."). As such, it appears to the examiner that Claim 13 should depend from Claim 12, not Claim 14. However, for the purposes of examination, the examiner has interpreted Claim 13 to depend from Claim 14, as presented by the applicant.

10. For the purposes of examination and in light of the applicant's disclosure (see, for example, paragraph [00014] of the specification and Figure 1), the examiner has reasonably interpreted Claim 16 (which depends from Claim 15) to require both (1) a "ramp-up" followed by a "ramp-down" in temperature and (2) a "spike-up" and "spike-down" in temperature. In other words, the examiner has interpreted the "spike-up" and "spike-down" in temperature recited in Claim 16 to be different from (i.e., not equivalent to) the "ramp-up" and "ramp-down" in temperature.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 34 – 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Lemaire et al. (USPN 5,478,371).

13. Regarding independent **Claim 34** (from which Claims 35 – 38 depend), Lemaire et al. teaches a method of producing an optical element (Abstract), the method

comprising exposing an optical fiber to a hydrogen-rich atmosphere for a treatment period of time, regulating a hydrogen partial pressure of the hydrogen-rich atmosphere during the treatment period of time, wherein the regulating comprises maintaining the hydrogen partial pressure below one atmosphere during the treatment period of time (Col.2, lines 31 – 61), and irradiating the optical fiber with electromagnetic radiation (Col.1, lines 25 – 34, and Col.3, lines 13 – 35 and 49 – 55). Specifically, Lemaire et al. teaches that hydrogen is diffused into the glass body (i.e., the optical fiber) by exposing the body to hydrogen gas at a pressure of, for example, 14 psi (~0.95 atm) (i.e., maintaining the hydrogen partial pressure below one atmosphere during the treatment period of time, as required by the applicant's claims) (Col.2, lines 48 – 52). Lemaire et al. does not explicitly teach that the optical fiber is a "high photosensitivity" optical fiber. However, Lemaire et al. does teach that the glass of the optical fiber is preferably GeO_2 doped silica (Col.2, lines 35 – 40) with a GeO_2 concentration of up to 20 mole % (Col.2, lines 42 – 44). This is equivalent to a "high photosensitivity" optical fiber as claimed and disclosed by the applicant (see, for example, Claim 38 and paragraph [00029] of the applicant's specification). Regarding **Claims 35 and 36**, Lemaire et al. also teaches maintaining a temperature of the hydrogen-rich atmosphere below about 100° C (Claim 35), particularly below about 75° C (Claim 36) (Col.2, lines 50 – 54). Regarding **Claims 37 and 38**, Lemaire et al. also teaches that the optical fiber is a germanium-doped optical fiber (Claim 37) wherein the germanium-doped optical fiber comprises at least 4.5 mole % GeO_2 (Claim 38) (Col.2, lines 39 – 45).

14. Claims 34 – 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Atkins et al. (USPN 5,500,031).

15. Regarding independent **Claim 34** (from which Claims 35 – 38 depend), Atkins et al. teaches a method of producing an optical element (Abstract and Col.1, lines 17 – 20), the method comprising exposing an optical fiber to a hydrogen-rich atmosphere for a treatment period of time, regulating a hydrogen partial pressure of the hydrogen-rich atmosphere during the treatment period of time, wherein the regulating comprises maintaining the hydrogen partial pressure below one atmosphere during the treatment period of time (Abstract, Col.1, lines 42 – 47, and Col.2, lines 15 – 44), and irradiating the optical fiber with electromagnetic radiation, for example a focused CO_2 laser (Col.2, lines 61 – 62, Col.3, lines 1 – 12). Specifically, Atkins et al. teaches that hydrogen is diffused into the glass body (i.e., the optical fiber) by exposing the body to hydrogen gas at a pressure of, for example, 14 psi (~0.95 atm) (i.e., maintaining the hydrogen partial pressure below one atmosphere during the treatment period of time, as required by the applicant's claims) (Col.2, lines 26 – 30). Atkins et al. does not explicitly teach that the optical fiber is a "high photosensitivity" optical fiber. However, Atkins et al. does teach that the glass of the optical fiber is preferably GeO_2 doped silica (Col.2, lines 18 – 21) with a GeO_2 concentration of up to 20 mole % (Col.2, lines 23 – 25). This is equivalent to a "high photosensitivity" optical fiber as claimed and disclosed by the applicant (see, for example, Claim 38 and paragraph [00029] of the applicant's

specification). Regarding **Claims 35 and 36**, Atkins et al. also teaches maintaining a temperature of the hydrogen-rich atmosphere below about 100° C (Claim 35), particularly below about 75° C (Claim 36) (Col.2, lines 30 – 32). Regarding **Claims 37 and 38**, Atkins et al. also teaches that the optical fiber is a germanium-doped optical fiber (Claim 37) wherein the germanium-doped optical fiber comprises at least 4.5 mole % GeO_2 (Claim 38) (Col.2, lines 17 – 25).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

18. Claims 34 – 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Enomoto et al. (USPN 6,580,854 B1).

19. Regarding independent **Claim 34** (from which Claims 35 – 38 depend), Enomoto et al. teaches a method of producing an optical element (Abstract), the method comprising exposing an optical fiber to a hydrogen-rich atmosphere for a treatment period of time, regulating a hydrogen partial pressure of the hydrogen-rich atmosphere during the treatment period of time, wherein the regulating comprises maintaining the hydrogen partial pressure at 20 atmospheres or less during the treatment period of time (Abstract, Col.4, lines 10 – 18, Col.5, lines 36 – 50, and Col.11, lines 4 – 24), and irradiating the optical fiber with electromagnetic radiation (Col.4, lines 10 – 18, Col.10, lines 26 – 37, and Col.11, lines 4 – 24). Additionally, the optical fiber of Enomoto et al. is a "high-photosensitivity" optical fiber, as required by the applicant's claims (Col.4, lines 10 – 38, Col.10, lines 43 – 49, and Col.11, lines 18 – 24). The range of hydrogen loading pressures taught by Enomoto et al. (i.e., 20 atmospheres or less) overlaps the applicant's claimed hydrogen partial pressure range of below one atmosphere. Therefore, it would have been obvious to one of ordinary skill in the art to select and utilize the portion of the range of hydrogen loading pressures taught by Enomoto et al. corresponding to the applicant's claimed range (i.e., below one atmosphere) because such pressures are clearly contemplated by Enomoto et al. and operable in the hydrogen loading process of Enomoto et al. Please note that, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art", a *prima facie* case of

obviousness exists (*In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990)). Regarding **Claims 35 and 36**, Enomoto et al. also teaches maintaining a temperature of the hydrogen-rich atmosphere below about 100° C (Claim 35), particularly below about 75° C (Claim 36) (See Examples 1 – 9, which teach hydrogen loading temperatures of 50° C). Regarding **Claims 37 and 38**, Enomoto et al. also teaches that the optical fiber is a germanium-doped optical fiber (Claim 37) wherein the germanium-doped optical fiber comprises at least 4.5 mole % GeO_2 (Claim 38) (Abstract, Col.6, lines 37 – 41 and 61 – 65).

20. Claims 1 – 4, 8, 9, 14, 15, 18, and 20 – 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cullen et al. (USPN 6,146,713).

21. Regarding independent **Claims 1 and 14**, Cullen et al. teaches a method of producing an optical element, specifically enhancing the photosensitivity of an optical element (Abstract, Col.2, lines 17 – 20, Col.3, lines 22 – 24, and Col.4, lines 15 – 29), the method comprising disposing the optical element "48" in a confinement chamber "50" (Figures 2 and 3, Col.7, lines 1 – 4 and 30 – 35), introducing a hydrogen-rich atmosphere into the confinement chamber and exposing the optical element "48" to the hydrogen-rich atmosphere for a treatment period of time (Col.3, lines 22 – 49, Col.7, lines 8 – 13, 37 – 41, and 50 – 55), regulating a temperature of the hydrogen-rich atmosphere over a treatment period of time (Col.3, lines 30 – 34, and Col.7, lines 37 – 49), and irradiating the optical element with electromagnetic

radiation to write a Bragg grating into the waveguide (Col.1, lines 55 – 67, Col.2, lines 1 – 16, Col.5, lines 49 – 59, and Col.7, lines 56 – 67). Cullen et al. does not explicitly teach that the temperature regulation comprises varying and/or increasing the temperature of the hydrogen-rich atmosphere over a portion of the treatment time. However, Cullen et al. does teach the following: "In the operation of the device 50, the waveguide 48 is placed into the device 50, such that sections to be selectively hydrogenated are placed within one of the hot zones 50_H. The device 50 is sealed and the air within the device 50 is evacuated and/or purged with a gas that will not substantially affect the waveguide 48, such as nitrogen. Hydrogen can be used to purge the device 50, although it is generally desirable to use a less expensive purge gas" (Col.7, lines 1 – 8). In other words, Cullen et al. teaches that the waveguide is present in the sealed device during the purging step (i.e., prior to the hydrogenation step). Cullen et al. goes on to state that the hydrogen gas is introduced from a gas source "52" into the device, and conditions are established for a requisite period of time to perform the selective hydrogenation (Col.7, lines 8 – 13). These hydrogenation "conditions" include an elevated temperature of, for example, greater than 250° C (Col.3, lines 66 – 67, Col.6, lines 20 – 26, and Col.8, lines 26 – 29) that is controlled by heat exchangers "60" (Col.7, lines 42 – 46). In other words, Cullen et al. teaches that the atmosphere in the device is heated / regulated to be a desired elevated temperature. Cullen et al. is silent as to whether the device / atmosphere in the device is heated to the desired temperature (1) prior to introducing the hydrogen gas into the device, or (2) after introducing the hydrogen

gas into the device. However, the two scenarios described above are the only two options in the process of Cullen et al. (i.e., either the device / atmosphere in the device is heated to the desired temperature prior to introducing the hydrogen gas into the device or after introducing the hydrogen gas into the device). It would have been obvious to one of ordinary skill in the art to introduce the hydrogen gas into the device "50" housing the waveguide "48" and then to heat the hydrogen-rich atmosphere inside the device to the temperature desired by Cullen et al. (i.e., to increase / vary the temperature of the hydrogen-rich atmosphere over a portion of the treatment time, as required by the applicant's claims) with the reasonable expectation of (1) success, as the device and process of Cullen et al. is clearly capable of heating the atmosphere inside the device to a desired elevated temperature (i.e., the hydrogenation temperature), and (2) obtaining the benefits of heating the device / atmosphere after introducing the hydrogen gas (i.e., as opposed to heating prior to introducing the hydrogen gas), such as (a) the ability to control the rate at which the hydrogen gas, an explosive gas, is heated (as opposed to introducing the hydrogen gas directly into a hot device), thereby maximizing the safety of the process, and (b) maximizing the amount of time that the waveguide is exposed to the hydrogen gas, thereby increasing process throughput.

22. Cullen et al. also teaches all the limitations of **Claims 2 – 4, 8, 9, 15, 18, and 20 – 23** as set forth above in paragraph 21 and below, including a method wherein / further comprising:

- Claim 2: The temperature regulation comprises decreasing the temperature of the hydrogen-rich atmosphere over a second portion of the treatment time subsequent to the step of increasing the temperature. While Cullen et al. does not explicitly teach this limitation, Cullen et al. does teach that, following the selective hydrogenation (i.e., following the step of increasing the temperature of the hydrogen-rich atmosphere), the device is cooled, the system pressure and temperature are lowered to ambient, and the waveguides are removed from the device (Col.7, lines 13 – 16). There are only two possible options for the aforementioned cooling / temperature lowering process: (1) all the hydrogen gas is removed from the device at the high process temperature, and then the system pressure and temperature are lowered to ambient, or (2) the device is cooled, and the system temperature is lowered to ambient with the hydrogen gas remaining in the device (i.e., until the system pressure also reaches ambient). It would have been obvious to one of ordinary skill in the art to cool the device / atmosphere of Cullen et al. before the hydrogen is removed from the device or while the hydrogen is being removed from the device (i.e., to decrease the temperature of the hydrogen-rich atmosphere over a second portion of the treatment time subsequent to the step of increasing the temperature) with the reasonable expectation of (1) success, as the device / atmosphere of Cullen et al. is clearly capable of being cooled to ambient temperature, and (2) obtaining the benefits of cooling the device / atmosphere to ambient simultaneously with or while removing the hydrogen

gas (i.e., reducing the system pressure to ambient), such as minimizing the process time due to the lack of an additional purging and/or evacuation step prior to the step of lowering the system pressure and temperature to ambient.

- Claim 3: A surrounding atmosphere external to the confinement chamber is at a room temperature, and a temperature of the hydrogen-rich atmosphere prior to the temperature increasing step is substantially equal to the room temperature of the surrounding atmosphere. Specifically, Cullen et al. does not teach or in any way suggest that the hydrogen gas supplied into the confinement chamber from external gas source "52", or the confinement chamber itself, is heated prior to the step of increasing the temperature of the hydrogen-rich atmosphere. Therefore, it would have been obvious to one of ordinary skill in the art to maintain all the atmospheres in the process of Cullen et al. (i.e., the surrounding atmosphere, the atmosphere of the confinement chamber, the hydrogen-rich atmosphere, etc.) at a "room temperature" prior to the temperature increasing step of Cullen et al. with the reasonable expectation of successfully and advantageously performing the hydrogenation process of Cullen et al. as simply and inexpensively as possible due to the lack of any extraneous heating and/or cooling steps being performed in the process.
- Claim 4: A temperature of the hydrogen-rich atmosphere subsequent to the temperature decreasing step is substantially equal to the room temperature of the surrounding atmosphere (Col.7, lines 13 – 16).

- Claims 8, 9, 21 and 22: The optical element is an optical waveguide, specifically and optical fiber (Abstract, Col.5, lines 49 – 53, and Col.8, lines 10 – 19).
- Claim 15: The temperature varying step comprises a ramp-up in temperature followed by a ramp-down in temperature (see the discussion of Claims 1 and 2 above).
- Claim 18: Varying a partial pressure of the hydrogen-rich atmosphere during the ramp-up and ramp-down in temperature (see Col.7, lines 11 – 16, and the discussion of Claim 2 above, in which the examiner showed that it would have been obvious to one of ordinary skill in the art to cool the device / atmosphere to ambient (i.e., to ramp-down the temperature of the hydrogen-rich atmosphere) simultaneously with or while removing the hydrogen gas from the system (i.e., reducing the system and hydrogen pressure to ambient)).
- Claim 20: Terminating the exposure of the optical element to the hydrogen-rich atmosphere, wherein the temperature of the hydrogen-rich atmosphere is substantially at a room temperature upon the aforementioned terminating (Col.7, lines 13 – 16).
- Claim 23: Irradiating the optical element with electromagnetic radiation causes a pattern of refractive index variations in the fiber (Col.1, lines 55 – 67, Col.2, lines 1 – 16, Col.5, lines 49 – 59, and Col.7, lines 56 – 67). Specifically, Cullen et al. teaches writing a Bragg grating into the optical fiber by exposing the fiber to electromagnetic radiation, and a Bragg grating is

equivalent to a pattern of refractive index variations in the fiber (for support of this statement, see, for example, Putnam et al. (USPN 6,249,624 B1) (Col.1, lines 20 – 30) and/or Schroeder et al. (USPN 5,841,131) (Col.3, lines 65 – 67 and Col.4, lines 1 – 18).

23. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cullen et al. (USPN 6,146,713) in view of Atkins et al.(2) (USPN 5,235,659).

24. Cullen et al. teaches all the limitations of **Claims 10 and 11** as set forth above in paragraphs 21 and 22, except for a method wherein the ramp-up-ramp-down temperature profile of the hydrogen-rich atmosphere (i.e., the hydrogen atmosphere temperature increasing and temperature decreasing process of Cullen et al. discussed in detail with regards to Claims 1 and 2 above) has a maximum value less than 250° C, particularly less than 100° C. Specifically, Cullen et al. teaches that it is desirable to perform the hydrogenation at temperatures in excess of 250° C (Col.3, lines 66 – 67). However, Cullen et al. also teaches that the temperature can be monitored and controlled (Col.7, lines 42 – 49) and that the precise conditions at which the hydrogenation is performed depends upon the desired characteristics in the Bragg grating to be written into the waveguide, the production requirements, and the capabilities of the skilled artisan (Col.7, lines 50 – 54). Atkins et al.(2) teaches an analogous method of manufacturing an optical fiber grating in which the hydrogenation step is performed at a temperature below 100° C (Col.2, lines 26 – 43, and Col.3, lines 18 – 43). Additionally, Atkins et al.(2) teaches that high

temperature hydrogenation treatments are disadvantageous because they can destroy polymeric optical fiber coatings, increase optical loss in the fiber, and/or weaken the fiber (Col.1, lines 44 – 56). Therefore, it would have been obvious to one of ordinary skill in the art to carry out the hydrogenation process of Cullen et al. at a maximum temperature of below 100° C (as taught by Atkins et al.(2)) with the reasonable expectation of (1) success, as Cullen et al. teaches that the precise conditions at which the hydrogenation is performed depends on several factors, and Atkins et al.(2) teaches that optical fiber hydrogenation can be carried out at a temperature below 100° C, and (2) obtaining the benefits of performing the hydrogenation at such a low temperature, such as reducing the amount of energy required to perform the process (i.e., due to the low temperature required), not weakening the fiber, not increasing optical loss in the fiber, and/or not destroying a polymeric coating on the fiber.

Allowable Subject Matter

25. Claims 5 – 7, 12, 13, 16, 17, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

26. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record, alone or in combination, does not teach or reasonably suggest (1) decreasing the hydrogen partial pressure of the hydrogen-rich atmosphere during the temperature increasing / ramping-up step (Claims 5 and 19),

(2) subsequently increasing the temperature of the hydrogen-rich atmosphere at a rate of increase that is greater than an earlier rate of temperature increase (Claim 6), and (3) the specific temperature profiles (e.g., temperature ramps and spikes) required by Claims 7, 12, 13, 16, and 17, in conjunction with the applicant's claimed method of producing / enhancing the photosensitivity of an optical element.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ojha (USPN 5,979,188) teaches that the temperature of an optical waveguide can be ramped-up and/or ramped-down to control the photosensitivity of the waveguide for subsequent grating writing steps. Urano et al. (USPN 5,983,673) teaches hydrogen-doping a silica glass article at a low pressure (e.g., 0.5 – 10 atm) and a low temperature (e.g., room T). Tuminaro (USPN 6,577,795 B2) teaches a process for treating optical fibers with deuterium gas in which the partial pressure of the deuterium gas is maintained while the temperature of the gas is reduced to ambient. Li et al. (USPN 5,572,609) teaches that pressure, temperature, and exposure time are all result / effective variables in an optical fiber hydrogen loading process.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wesley D Markham
Examiner
Art Unit 1762

WDM

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SUPERVISORY PATENT EXAMINER
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